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ADJUSTABLE, HERMETICALLY SEALED THERMOSTATIC SWITCHES

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Fig. 1.

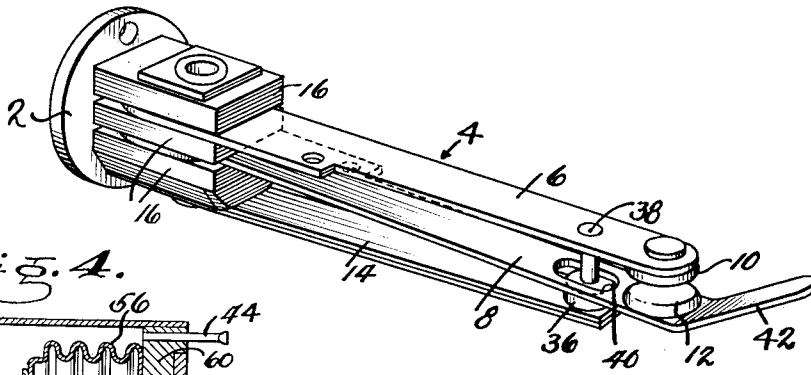


Fig. 4.

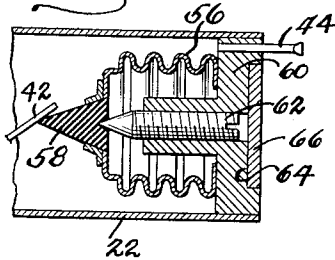


Fig. 2.

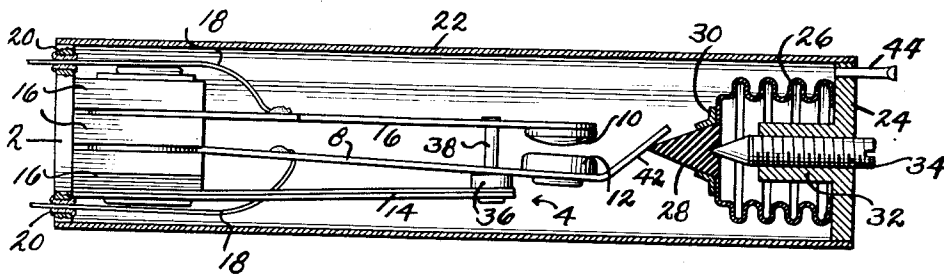
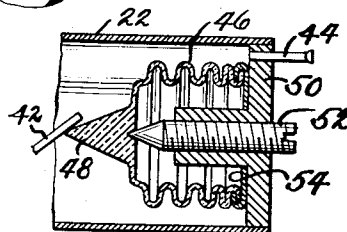


Fig. 3.



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ADJUSTABLE, HERMETICALLY SEALED THERMOSTATIC SWITCHES

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10 Claims. (Cl. 200—138)

My invention relates to adjustable, hermetically sealed thermostatic switches.

It is conventional to precalibrate or preset bimetal thermostatic switches and then to seal the assembly in an enclosure of metal or glass, for example, which may eventually be evacuated. Difficulty has been experienced with shifting of the switch setting or calibration after the assembly has been sealed in its enclosure.

The reason for this shifting has not been determined, so that, to produce a given quantity of sealed thermostatic switches, it has been necessary for the manufacturer to make up a much larger quantity of preset switches in order to obtain the given quantity within the calibration tolerance allowed.

It is very obvious that such procedure is very costly, involving selective testing after sealing, and, as above pointed out, there are many rejects.

My invention eliminates these difficulties in that, broadly, I provide a construction wherein the switch may readily be calibrated after sealing.

Generally speaking, my invention provides a construction wherein one of the contacts of the switch can be adjusted positively from the enclosure exterior after assembly and evacuation have been completed. In other words, my invention provides for the positive temperature adjustment of a hermetically sealed thermostatic switch.

In the accompanying drawings,

Fig. 1 is an isometric view of a thermostatic switch embodying my invention;

Fig. 2 is a part sectional elevational view of the assembly of Fig. 1, sealed within its enclosure in accordance with the invention;

Fig. 3 is a fragmentary sectional view, illustrating a modified adjusting or calibrating mechanism; and

Fig. 4 is a fragmentary sectional view, illustrating a still further modification.

Referring to the drawings in detail and first of all to Figs. 1 and 2:

2 designates the back plug of a bimetal thermostatic switch assembly 4, comprising spring contact arms 6 and 8, carrying contacts 10 and 12, respectively; 14 designates the bimetallic switch-controlling element. The contact arms and bimetallic element are insulated from each other by insulating blocks 16, and all are insulated from and rigidly secured to the back plug 2.

The two conductors 18 of the switch are led through the back plug 2 through fused glass bushings, as shown at 20.

The contact arm 6 and its contact 10 are movable under the control of the thermo-sensitive element 14, while the arm 8 and its contact 12 are adjustable relatively to arm 6 and contact 10, as will be brought out more fully hereinafter.

22 designates an enclosure within which the switch assembly is to be hermetically sealed.

This enclosure may be metal or glass or other suitable material, and, as will be seen from the drawings, the back

plug 2, which is soldered or cemented in place, hermetically seals one end of 22. The other end of 22 is hermetically sealed by a front plug 24 of metal or other suitable material, cemented, soldered or otherwise hermetically and permanently sealed in place.

Soldered or otherwise permanently secured to the inner face of the front plug 24 is metal bellows 26. The inner end of the bellows carries a conical plug 28 of insulating material, to the rear end of which is permanently secured a metal retaining ring 30, soldered or otherwise rigidly secured to the end of the bellows. The other end of the bellows 26 is soldered or welded or otherwise sealed to the plug 24.

On the inner face of the front plug 24 and extending for a short distance within the bellows 26 is an integral boss 32, bored longitudinally and threaded to receive a calibrating screw 34, which is adapted to engage a depression in the insulating conical plug 28. Obviously, by turning the screw 34 in one direction or the other, the bellows 26 will be elongated or shortened, as the case may be, and likewise the insulating plug 28 will be moved toward or away from the contact end of the spring arms 6 and 8.

Secured to the free end of the bimetallic arm 14 is a block of insulation 36, and riveted or otherwise rigidly secured to the contact arm 6 is a pin 38, which extends from the under side of the arm 6 and through a hole 40 in the contact arm 8 and into contact with the block of insulation 36, carried by the bimetallic arm. On a normally-open type of switch, deflection of the bimetallic strip away from contact arm 8, due to temperature rise, will, of course, move the insulating block 36 away from the end of the pin 38 and permit the spring arm 6 to close contact 10 upon contact 12. On a normally-closed type of switch, the bimetallic strip or arm 14 will be set so as to be deflected toward the contact arms upon a temperature rise, so that the pin 38 will be moved in a direction to separate the contacts 10 and 12.

In both types of switch, no motion is imparted to the spring arm 8 by the bimetallic arm, the pin 38 passing freely through this arm.

In order that the switch may be calibrated or set after being sealed within the enclosure 22, the spring contact arm 8 is extended toward the bellows end of the assembly and is bent on a 45° angle, as shown at 42. This extension of the spring arm 8 is long enough constantly to engage the inner end of the conical insulator 28 carried by the inner end of the bellows 26.

It is obvious that, by adjustment of the screw 34, the spring contact arm 8 will be deflected so as to decrease or increase the distance the bimetallic element 14 must be deflected to obtain the desired opening or closing of the contacts 10 and 12, depending upon whether the switch is of the normally-open type, as illustrated, or of the normally-closed type above referred to.

As above pointed out, it is customary to evacuate the enclosure 22 after assembly has been completed, and the tube 44 has been shown for this purpose, the tube being pinched closed when evacuation is completed.

With my construction it will be obvious that all calibrating can be positively effected from the exterior of the enclosure 22 after all assembling has been completed. It will be equally obvious that a given quantity of units can be produced to operate within permitted calibration tolerances without rejects and without the tedious and costly testing heretofore necessary with prior structures.

The construction illustrated in Fig. 3 is precisely the same as that just described, except for the construction of the calibrating or adjusting mechanism. In this embodiment of my invention, I provide a bellows 46 of

glass, having an inner conical end 48 either integral with or separate from the bellows. The plug 50 for the enclosure end may be of the same construction as 24 of Fig. 2 and be provided with adjusting screw 52 like the screw 34 of Fig. 2. The outer end of the bellows 46 may be sealed to the inner face of plug 50 by a ring 54 to which the bellows is fused, the ring being soldered or otherwise hermetically sealed to the plug 48.

In the embodiment illustrated in Fig. 4 I have provided a construction for preventing the adjustment bellows from being affected by extreme changes in atmospheric pressures, such as might be encountered on aircraft, for example.

In this construction I provide calibrating bellows 56 equipped with conical insulating plug 58 for engaging the extended end of the adjustable contact arm, just as explained in connection with Figs. 1 and 2. The front closure plug 60 for the switch enclosure 22 is equipped with a calibrating screw 62, the function of which, of course, is the same as that of the screw 34 of Fig. 2. In this embodiment of my invention the plug 60 is provided with a depression 64 in its outer face, and the calibrating screw 62 terminates just short of the bottom of this depression. After the switch has been assembled and evacuated, it is calibrated by manipulation of the calibrating screw 62. I then seal the screw 62, to prevent any extreme changes in atmospheric pressure altering the characteristics of the bellows 56 by forcing air past the screw 62. This sealing off of the screw 62 I accomplish by applying a sealing disc 66 to the depression 64 in the plug 60. This sealing disc is imperforate and is soldered or otherwise hermetically sealed in place.

It will be seen from all of the foregoing that my invention provides a construction in hermetically sealed bimetallic thermostatic switches wherein the difficulties inherent in prior constructions have been eliminated.

It is to be understood that changes may be made in the details of construction and arrangements of parts illustrated and described within the purview of my invention.

What I claim is:

1. In a device of the class described, a sealed container or enclosure; switching mechanism mounted therein and comprising a thermo-sensitive element and a plurality of spring contact arms, at least one of which is movable under the control of the said thermo-sensitive element, another of said contact arms being adjustable relatively to said movable contact arm; and means insulated from said contact arms for effecting the positive adjustment of said adjustable contact arm from the exterior of the said container or enclosure with the seal of the container intact and without imparting movement to the thermostatic element.

2. In a device of the class described, a hermetically sealed container or enclosure; switching mechanism mounted therein and comprising a thermo-sensitive element and a plurality of spring contact arms, at least one of which is movable under the control of said thermo-sensitive element, another of said contact arms being adjustable relatively to the said movable contact arm; and means insulated from the contact arms operable from the enclosure exterior and, with the hermetic seal of the enclosure intact, for effecting the positive adjustment of the adjustable contact arm without altering the characteristics and setting of the thermo-sensitive element.

3. In a device of the class described, a hermetically sealed container or enclosure; switching mechanism mounted therein, said structure comprising spring contact arms adapted to open or close an electrical circuit, one of said contact arms being movable under thermal control, another of said contact arms being adjustable relatively to said movable contact; and means coaxial

with the switching mechanism operable from the enclosure exterior and, with the enclosure seal intact, for effecting the positive adjustment of the adjustable contact arm, said adjusting means being insulated from said contact arms.

4. In a device of the class described, a sealed container or enclosure; switching mechanism mounted therein and comprising a plurality of electrical contacts, one of said contacts being movable under thermal control, another of said contacts being mounted on a spring contact arm and being adjustable relatively to the movable contact; a bellows sealed to one end of the said container or enclosure and extending inwardly of the enclosure, the inner end of said bellows being of insulating material and bearing against said contact arm; and means coaxial with the said bellows operable from the exterior of said container or enclosure whereby the said bellows will be elongated or contracted to effect a corresponding adjustment of said contact arm and the contact carried thereby relatively to said movable contact.

5. In a device of the class described, a container or enclosure; a back plug and a front plug sealing the two ends of the container; switching mechanism within the container comprising a plurality of contact-carrying arms and a thermo-sensitive element mounted on one of said plugs, one of said contact arms and the contact carried thereby being movable under the control of said thermo-sensitive element, another of said contact arms and the contact carried thereby being adjustable relatively to the movable arm and its contact; and calibrating means coaxial with the switching mechanism carried by said front plug and operable from the enclosure exterior with the seal intact for effecting positive adjustment of the adjustable contact arm and its contact relatively to the movable contact and while the characteristics of the thermo-sensitive element remain intact.

6. In a device of the class described, a container or enclosure; a back plug and a front plug sealing the two ends of the container; switching mechanism within the container mounted upon one of said plugs; and calibrating mechanism carried by the other of said plugs; said switching mechanism comprising a plurality of contact arms, a contact carried by each arm, and a thermo-sensitive element, one of said arms and its contact being movable under the control of said thermo-sensitive element, another of said arms and its contact being adjustable relatively to the movable arm and contact; said calibrating mechanism comprising a calibrating screw operable from the exterior of said container for varying the setting of said calibrating mechanism without movement of the thermostatic element while the seal of the container remains intact, to effect the said adjustment of the adjustable contact arm and its contact.

7. In a device of the class described, an enclosure; a back plug and a front plug sealing the two ends of the enclosure; switching mechanism within the enclosure comprising a plurality of spring contact arms and a thermo-sensitive element mounted on the back plug; a pin rigidly secured to one contact arm and passing loosely through another contact arm; insulation attached to the thermo-sensitive element and cooperating with said pin, whereby movement of the pin-carrying contact arm is under the control of the thermo-sensitive element, the free end of the contact arm through which said pin extends projecting forwardly from its contact and out of the plane of the arm; a metal bellows sealed to the inner face of said front plug; an insulating piece secured to the inner end of said bellows and in constant engagement with the said contact arm projection or extension; and a screw passing through said forward plug into engagement with the said insulating piece carried by the bellows, said screw being rotatable from without the enclosure and, with the enclosure seal intact, to adjust the extended contact arm relatively to the pin-carrying arm.

8. In a device of the class described, a hermetically

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sealed container or enclosure; switching mechanism therein comprising a thermo-sensitive element, a movable spring contact arm, movable under the control of said element, another spring contact arm, adjustable relatively to the movable contact arm; calibrating means including a glass bellows engaging the adjustable contact arm for adjusting the contact arm; and a calibrating screw threaded through one end of the container or enclosure into the bellows and into engagement with the inner end of the bellows, said screw being rotatable while the container hermetic seal remains intact, to vary the length of said bellows without imparting movement to the thermo-sensitive element thereby to effect the desired adjustment or calibration of the adjustable contact arm, without altering the characteristics of the thermo-sensitive element.

9. In a device of the class described, an enclosure or container; a sealing plug for hermetically sealing each end of the container; switch mechanism within the container carried by one of said plugs, said switch comprising a pair of spring contact arms, one of which is movable under varying temperature conditions, the other of which is adjustable relatively to the movable contact arm; a bellows secured to the other of said plugs the inner end of the bellows being electrically insulated from and engaging the adjustable contact arm; a calibrating screw passing through said last-named plug and extending into the bellows into engagement with the inner end of the bellows to vary the length of the bellows, thereby to effect adjustment of the adjustable contact while the seal of the container remains intact, the bellows and calibrating screw being in axial alignment with said switch mechanism, the outer face of the screw-carrying plug being provided with a depression, and said calibrating screw passing

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through this portion of the plug; and an imperforate disc sealed in said depression and overlying the head of the calibrating screw, thereby to prevent varying air pressures from changing the setting of said bellows.

10. A thermostatic switch comprising, in combination, a hermetically sealed enclosure; switching mechanism therein comprising a plurality of spring contact arms; a thermo-sensitive element within said enclosure for controlling the movement of one of said contact arms; insulating mounting means within the said enclosure for one end of each of said contact arms and one end of the said thermo-sensitive element, the other end of said arms and element being free; a head for each end of said enclosure; an adjusting member extending through one of said heads along the axis of the enclosure for adjusting the spacing of the free ends of the contact arms from each other; and leads attached to said contact arms and extending through the other head of the enclosure.

References Cited in the file of this patent

UNITED STATES PATENTS

1,643,575	Clark	Sept. 27, 1927
1,851,657	Appelberg	Mar. 29, 1932
1,940,300	Gerdien et al.	Dec. 19, 1933
1,972,975	Brady	Sept. 11, 1934
1,983,077	Getchell	Dec. 4, 1934
2,090,407	Turenne	Aug. 17, 1937
2,698,367	Poitras	Dec. 28, 1954

FOREIGN PATENTS

6,471 of 1908	Great Britain	Jan. 28, 1909
276,641	Great Britain	Oct. 26, 1928